

Original Research

Age of first deciduous tooth eruption in a Portuguese children population: a cross-sectional study



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ABSTRACT

Objectives: To define the timing of the first deciduous tooth eruption in a sample of Portuguese children.

Methods: Observational study including a convenience sample of 2115 healthy Portuguese children aged between 1-24 months. A single clinician performed the oral observation under an artificial light source, identifying the first erupted deciduous tooth and registering age (in months). Data were analyzed with IBM® SPSS® v24, R v3.3.2, and Python v3.7.1 ($\alpha=0.05$). The percentiles of the age of first tooth eruption were determined, along with the cumulative probability curve for both genders and the proportion of first erupted tooth type per gender with its confidence interval.

Results: The age of first tooth eruption was slightly inferior in males (mean=7.01 (\pm 2.24); median=6.0 months; 95% CI [5.8, 6.2]) than in females (mean=7.55 (\pm 2.41); median=6.5 months; 95% CI [6.3, 6.7]), with a statistically significant difference. The first deciduous tooth erupting was the mandibular central incisor, on average, at 6.94 (\pm 2.10) months in males and 7.49 (\pm 2.17) months in females.

Conclusions: The present study indicates that, unequivocally, the mandibular central incisor was most often the first deciduous tooth to erupt, and, on average, that happened at 6.94 months for males and at 7.49 months for females. (Rev Port Estomatol Med Dent Cir Maxilofac. 2022;63(3):141-146)

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Idade de erupção do primeiro dente decíduo numa população de crianças portuguesas: um estudo transversal

R E S U M O

Palavras-chave:

Idade de erupção
Dente decíduo
Erupção dentária

Objetivos: Definir a idade de erupção do primeiro dente decíduo numa amostra de crianças portuguesas.

Métodos: Estudo observacional envolvendo uma amostra de conveniência de 2115 crianças saudáveis (1-24 meses de idade). Um examinador único realizou a observação oral para identificação do primeiro dente decíduo erupcionado, registando-se a idade de ocorrência. Para registo e análise dos dados, recorreu-se ao IBM® SPSS® v24, R v3.3.2 e Python v3.7.1 ($\alpha=0,05$). Determinaram-se os percentis da idade de erupção do primeiro dente, bem como a curva de probabilidade acumulada para os géneros, aferindo a proporção por tipo de dente em cada género e definindo-se o intervalo de confiança para a proporção.

Resultados: O género masculino apresentou uma idade (média=7,01 ($\pm 2,24$); mediana=6,0 meses; IC 95% [5,8, 6,2]) ligeiramente inferior ao feminino (média=7,55 ($\pm 2,41$); mediana=6,5 meses; IC 95% [6,3, 6,7]), com diferenças estatisticamente significativas. O primeiro dente a erupcionar foi, com maior frequência, um dos incisivos centrais inferiores aos 6,94 ($\pm 2,10$) meses no género masculino e aos 7,49 ($\pm 2,17$) meses no feminino.

Conclusões: O presente estudo indica, inequivocamente, que o incisivo central inferior foi mais frequentemente o primeiro dente a erupcionar, em média aos 6,94 meses no sexo masculino e aos 7,49 meses no sexo feminino. (Rev Port Estomatol Med Dent Cir Maxilofac. 2022;63(3):141-146)

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Introduction

The dental eruption consists of the movement, mostly axial, of teeth from the alveolar bone to a functional position in the oral cavity.¹⁻⁵ The development of deciduous teeth begins during the prenatal period.^{1,2,6} Their eruption generally starts with mandibular incisors at about 4-8 months old and ends with the second molars at around 24-36 months old, although a variation of approximately 6 months is acceptable.^{1,3,5-9} The most described sequence for both arches is the following: central incisor, lateral incisor, first molar, canine and second molar.^{2,5,10,11} This sequence may vary, as noted in the study by Woodroffe et al. in 2010, and the most common variation is between maxillary and mandibular central incisors and between maxillary and mandibular lateral incisors.¹⁰

The timing of eruption of deciduous dentition has been reported to vary widely between populations, suggesting a strong influence of environmental and genetic factors.^{1,5,7,8,11-13} Other factors, such as gender, socioeconomic status, gestation time, weight and height at birth, nutritional particularities, and maternal factors, have also been pointed out as having a relevant role.^{3,4,6-9,11-18} Concerning gender, tooth eruption seems to occur earlier in males than in females.^{19,20} Some studies also reported excessive weight gain and smoking during pregnancy as two of the prenatal factors that could lead to an earlier eruption of deciduous teeth.^{19,20} Conversely, tooth eruption seems to happen later in premature children with low weight and height at birth.^{19,20}

Knowing the normal pattern of dental eruption allows pediatric clinicians to identify developmental disorders or anomalies and act accordingly.^{10,14} In addition, the detailed characterization of the age of deciduous teeth eruption for a population is paramount as it can be applied at a forensic level to estimate age, particularly in cases that lack records of birth dates, as well as to identify disaster victims, among others.^{2,3,12,14}

Scientific literature related to this theme is still scarce,⁹ though some studies, mostly cross-sectional, have been developed to determine the age of eruption in several countries, namely, Jordan, Nigeria, Italy, and Australia.^{1,2,10,12} Regarding the Portuguese population, there are no systematic records. Therefore, this study aimed to determine the age of eruption of the first deciduous tooth in a large sample of Portuguese children, establishing percentiles and the corresponding distribution curve for males and females.

Material and Methods

This observational study was conducted in the Center of Portugal in healthy children with a gestational time beyond 37 weeks and normal height and weight at birth. All children with a systemic pathology, preterm delivery, and/or low weight at birth were excluded. The convenience sample consisted of 2115 children aged between 1 and 24 months.

Registration data were collected between January 2000 and December 2018 during the children's routine pediatric appointments at a private practice to which peers refer children

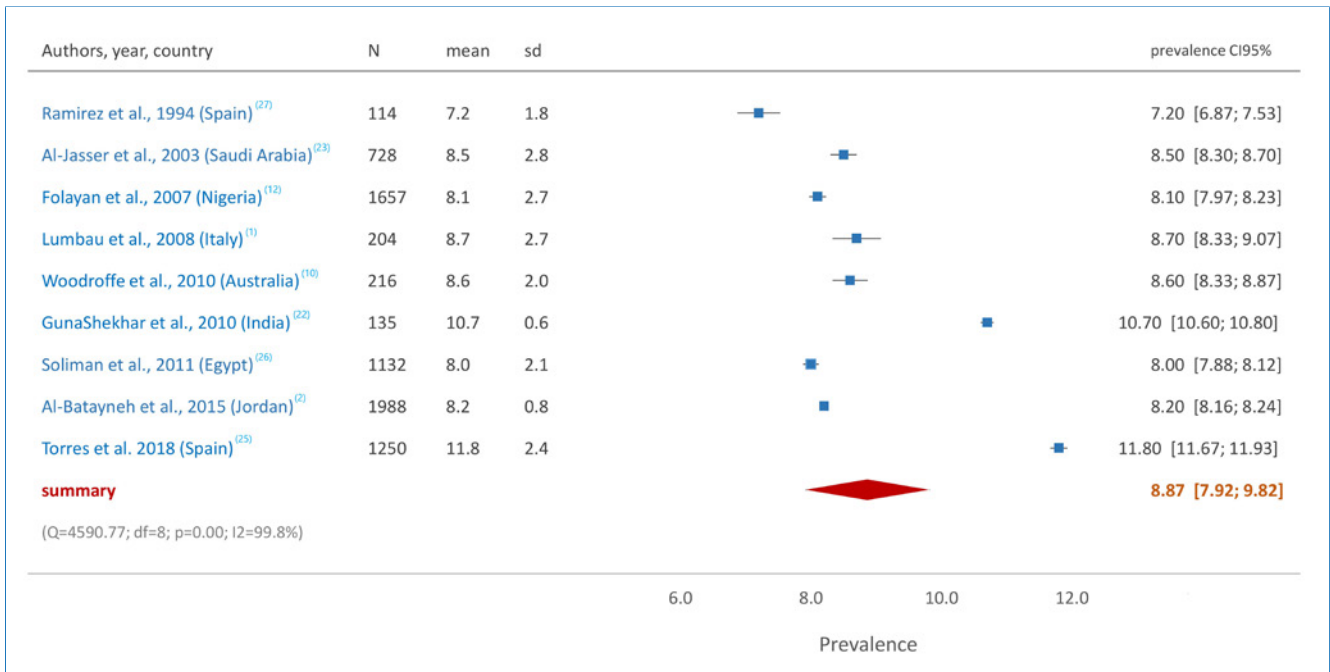


Figure 1. Forest plot indicating the age distribution, in months, of the first deciduous tooth eruption in different countries.

from all over the country. The month the first deciduous tooth erupted was determined by direct observation and report. A single evaluator, who is an experienced clinician, conducted a monthly oral observation under an artificial light source using a tongue depressor to identify the eruption of the first deciduous tooth, recording in months the age in which it occurred. Any tooth with any part of its crown visible in the oral cavity was considered erupted. The tooth type was also analyzed, although it was impossible to determine which tooth was involved in some cases, mainly between contralateral teeth.

Data analysis was conducted at the statistic platform IBM® SPSS® v24, in R v3.3.2 and using Python v3.7.1. The level of significance was set at 0.05. The percentiles of the age of first tooth eruption were determined, along with the cumulative probability curve for males and females. The curves' confidence bands and the median confidence intervals were calculated using a bootstrapping method with 1000 samples. The proportion and corresponding confidence interval of each tooth type per gender was also determined. Meta-analysis was performed in R using the metafor package. Random effects models were assumed, and heterogeneity was assessed with the I² statistics and Cochran's Q test. The results were presented in a forest plot (Figure 1).

Results

The sample comprised 2115 children, of which 1090 (51.5%) were male and 1025 (48.5%) female. Table 1 shows the percentiles of the timing of first tooth eruption in months by gender. Percentile 50 was established at 6.0 months for males and 6.5 months for females.

Figure 2 shows the cumulative probability curve, with confidence bands, related to the timing of first tooth eruption for

Table 1. Percentiles related to eruption timing of the first deciduous tooth and the first mandibular central incisor, in particular, in months.

Percentile	Eruption of the first deciduous tooth		Eruption of the first mandibular central incisor	
	Male	Female	Male	Female
5	1.9	2.2	2.1	2.4
10	2.9	3.3	3.1	3.4
15	3.6	4.0	3.7	4.1
20	4.1	4.5	4.1	4.5
25	4.5	4.9	4.5	4.9
30	4.8	5.3	4.9	5.3
35	5.2	5.6	5.2	5.6
40	5.5	5.9	5.4	5.9
45	5.7	6.2	5.7	6.2
50	6.0	6.5	6.0	6.4
55	6.3	6.8	6.2	6.7
60	6.6	7.1	6.5	7.0
65	6.9	7.4	6.8	7.3
70	7.2	7.7	7.1	7.6
75	7.6	8.1	7.4	7.9
80	8.0	8.5	7.8	8.3
85	8.5	9.0	8.2	8.8
90	9.1	9.7	8.8	9.5
95	10.1	10.8	9.8	10.5

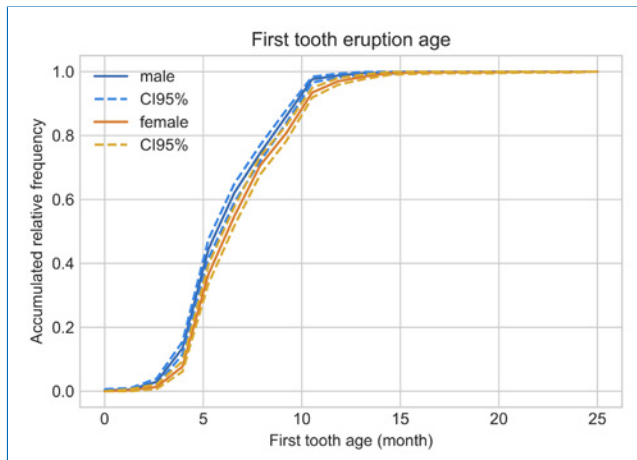


Figure 2. Cumulative probability curve for the eruption of the first deciduous tooth in males and females.

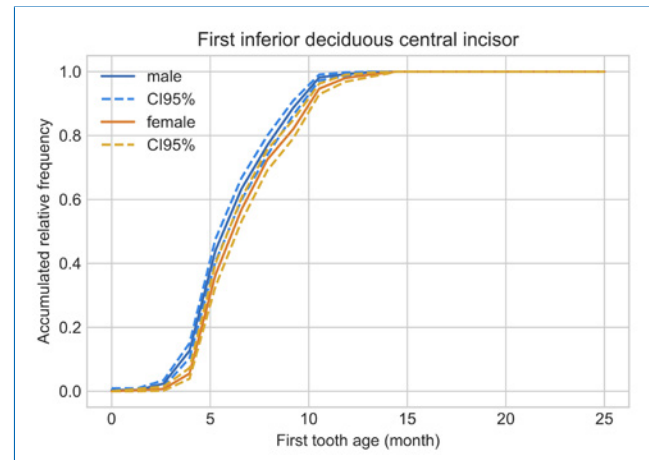


Figure 3. Cumulative probability curve for the eruption of the first deciduous mandibular central incisor in males and females.

Table 2. Observed frequency (n, %) of the first erupted tooth type per gender and corresponding confidence intervals.

First erupted tooth type	Male (814)	Female (732)
Maxillary central incisor	49 (6.0%, 95% CI [4.6, 7.9])	32 (4.4%, 95% CI [3.1, 6.1])
Maxillary lateral incisor	5 (0.6%, 95% CI [0.3, 1.4])	7 (1.0%, 95% CI [0.5, 2.0])
Mandibular central incisor	759 (93.2%, 95% CI [91.3, 94.8])	689 (94.1%, 95% CI [92.2, 95.6])
Mandibular lateral incisor	1 (0.1%, 95% CI [0.02, 0.7])	2 (0.3%, 95% CI [0.07, 1.0])
Mandibular canine	0 (0.0%, 95% CI [0.0, 0.0])	2 (0.3%, 95% CI [0.07, 1.0])

both genders. Timings were slightly earlier in the male gender (mean=7.01 (\pm 2.24); median=6.00 months; 95% CI [5.80, 6.20]) than the female gender (mean=7.55 (\pm 2.41); median= 6.50 months; 95% CI [6.30, 6.70]). The total sample showed a mean of 7.30 months (\pm 2.30) and a median of 6.30 months (95% CI [6.10; 6.40]).

Table 2 shows the frequency of the first erupted tooth type per gender and the corresponding confidence intervals. There was no statistically significant association ($p=0.257$) between the tooth type and gender. The mandibular central incisor was more frequently the first deciduous tooth to erupt, occurring in 93.2% (759 of 1090) of males and 94.1% (689 of 1025) of females.

Figure 3 shows the cumulative probability curve, with confidence bands, related to the age of eruption of the first mandibular central incisor per gender. On average, the first mandibular central incisor erupted at 6.94 (\pm 2.10) months in males and 7.49 (\pm 2.17) months in females, not representing a statistically significant difference between genders.

Discussion

The eruption of deciduous teeth is an important milestone in a child's development. In addition to aesthetic, phonetic, and masticatory functions, it is crucial as an eruption guide for permanent teeth.²¹

The available scientific literature states that the age of dental eruption varies widely between populations, indicating the influence of genetic and environmental factors. Other factors, such as gender, weight and height at birth, and nutritional patterns, also play a role.^{21,22} Therefore, gathering specific data on dental eruption timing for each population is important.^(22,23)

Estimating the age of dental eruption constitutes complementary information for pediatricians and pediatric dentists that allows the identification of developmental anomalies that could lead to systemic repercussions in their patients and contributes to an early implementation of preventive programs against early childhood caries, for example.^{2,10} Concomitantly, dental age estimation can be largely applied in forensic and anthropological investigations.^{2,10,12,21}

The present study aimed to determine the age at which the first deciduous tooth erupted and establish its relationship with gender. To our knowledge, this is the first study to gather this data specifically regarding the Portuguese population. The results showed that, unequivocally, the mandibular central incisor was most often the first deciduous tooth to erupt, and that happened, on average, at 6.94 (\pm 2.10) months for males and 7.49 (\pm 2.17) months for females. Other authors have also identified the mandibular central incisor as the first tooth to erupt, namely Shaweesh et al.²⁴ and Indira et al.²¹, in Jordanian and Indian children, respectively, although with a slightly later eruption.^{2,12,21,24} In fact, our study's sample tended to

present an earlier eruption (mean=7.3; median=6.3) than most populations already studied, namely, Spanish, Italian, Australian, Indian, Nigerian, Egyptian, and Saudi Arabian, in which the first deciduous tooth erupted, on average, after the 8 months of age.^{1,2,10,12,22,23,25-27} The results showed statistically significant differences, as there is no overlap of the confidence intervals.

Several authors have previously studied the relationship between dental eruption and gender, but it still generates controversy.^{22,23,26} The consulted studies indicated some tendency to an earlier eruption in males, and some reported that this tendency only occurred in certain tooth groups.^{12,25,26,28,29} In our sample, the first dental eruption occurred slightly earlier in males (mean=7.01 months; median=6.0 months) than in females (mean=7.55 months; median=6.5 months), with statistically significant differences, although without apparent clinical/physiological relevance. Other studies found similar results, namely Torres et al.²⁵, in which males showed a statistically significantly earlier eruption. On the other hand, Folayan et al.¹² in 2007 and Kariya et al.²⁸ in 2017 did not find statistically significant differences between genders.^{12,23,26,28} The differences between males and females are still poorly justified in the literature. In 2019, Wu et al.²⁰ hypothesized that this might be associated with differences in sexual maturity and growth pattern.

In both dentitions, dental eruption has been reported as tending to present symmetry between hemi-arches.^{2,23} Thus, the evaluation of each hemi-arch separately was not considered relevant.

The present study is considered observational (cross-sectional), which implies less risk of bias, larger samples, and better representativeness of the population in question compared to longitudinal studies.²⁸ The results presented as median made statistics more robust and, inherently, more adequate. Only the results concerning the first mandibular central incisor's eruption time (considered the first deciduous tooth to erupt) were shown as an average to allow comparison with studies whose results are in this format.^{21,28}

One of this study's limitations was not considering several factors capable of influencing the age and sequence of dental eruption, as previously mentioned. This evaluation is potentially relevant and promising because it may contribute to the knowledge and particular orientations of pediatricians and pediatric dentists regarding what could be considered physiological and/or potentially pathological and/or require complementary evaluation. Further studies in the Portuguese population with larger samples, possibly nationwide, would be of utmost interest to increase the transversality of results.

Conclusions

To our knowledge, this study was the first to evaluate the age of the first deciduous tooth eruption in a large sample of Portuguese children. Despite its limitations, it concluded that the mandibular central incisor was most often the first deciduous tooth to erupt, which occurred slightly earlier in males, with statistically significant differences between genders, but without relevant clinical and/or physiological translation. These results may contribute to clinical orientations and

highlight the importance and need for a good understanding of this subject, particularly to detect and further explore possible dental developmental disorders ahead of time.

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Conflict of interest

The authors have no conflicts of interest to declare.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed their work center protocols on access to patient data and for its publication.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

CREDIT AUTHORSHIP CONTRIBUTION STATEMENT

Bárbara Cunha: Formal analysis, Writing – original draft. **Manuel Salgado:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology. **Francisco Caramelo:** Data curation, Formal analysis, Methodology, Writing – review & editing. **Ana Luísa Costa:** Formal analysis, Methodology, Writing – review & editing.

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